

# SMB2 Model-Based Testing

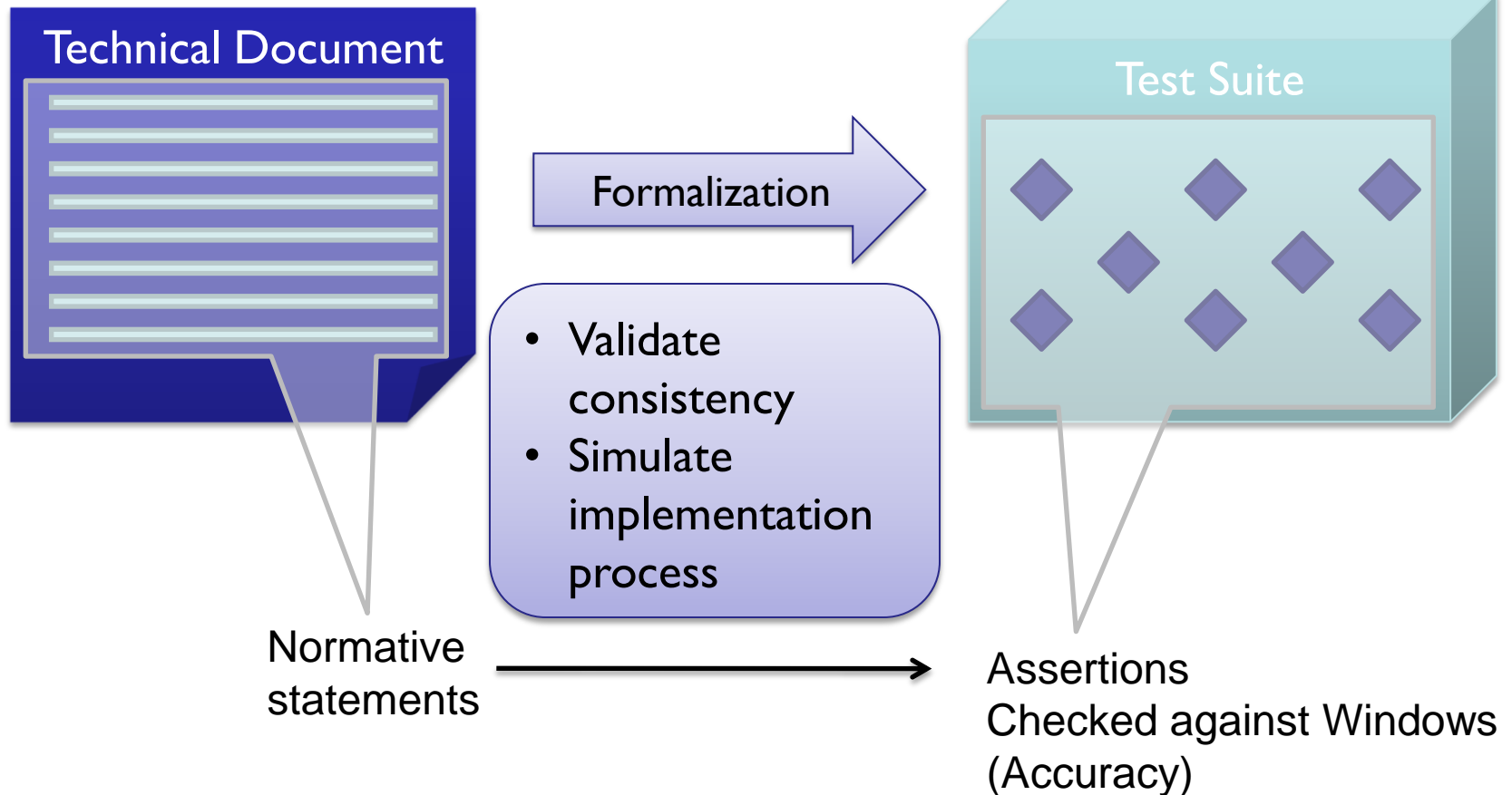
Nico Kicillof, Albert Lee

Microsoft

# “BlueLine” Technical Document Testing Project

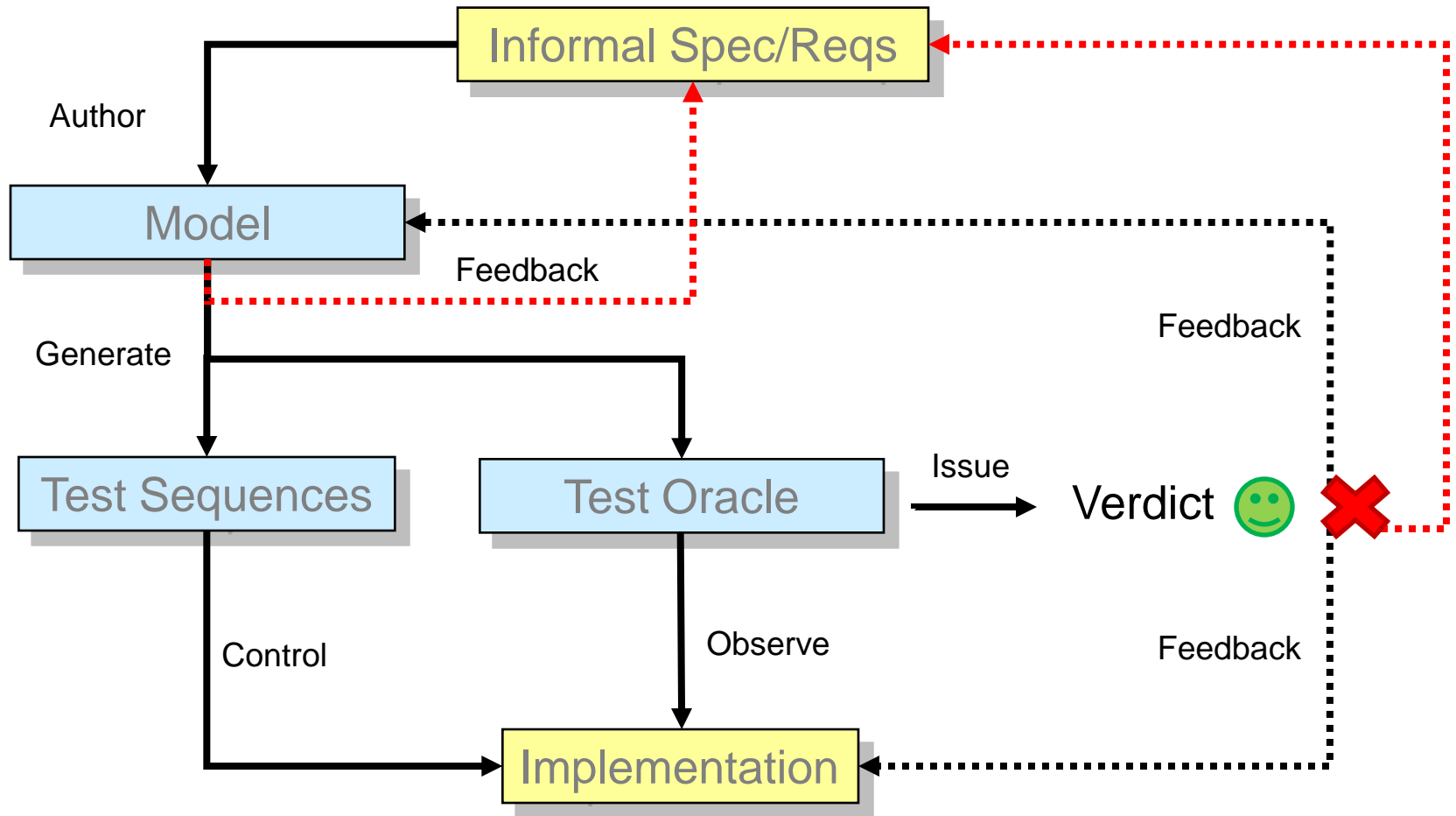
- ❑ 222 open protocol specifications tested
  - ❑ 22,847 pages
- ❑ ~10,000 document bugs
- ❑ 66,962 person days (250+ years)
- ❑ Tool dev center in Beijing
- ❑ Vendor test teams
  - ❑ Hyderabad: 250
  - ❑ Beijing: 100

# Test-Driven Document Analysis



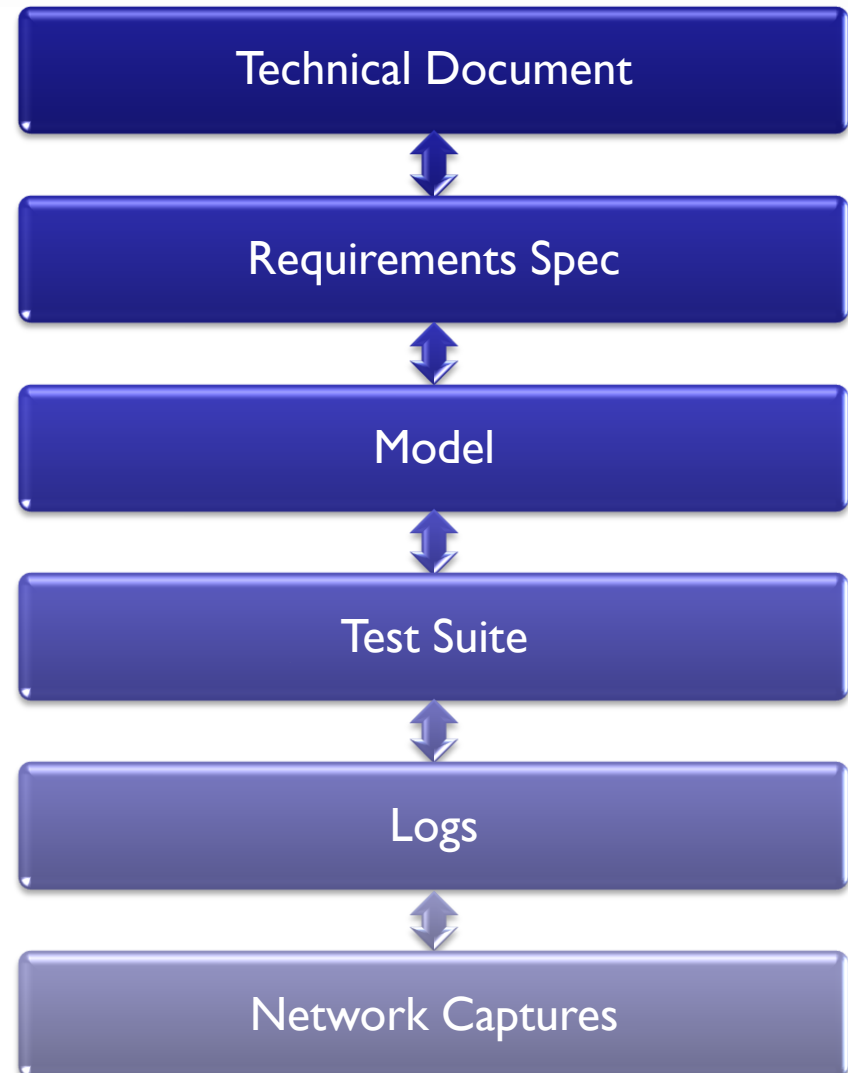
# Model-Based Testing

## A Lightweight Formal Method



# Requirements

- ❑ Gathered from technical document alone
  - ❑ Gatherers not protocol experts
  - ❑ Clean-room approach
  - ❑ Windows-specific behavior as separate requirements
  - ❑ Document testing
    - ❑ Not implementation
- ❑ Independent reviewers
- ❑ Main input for model design



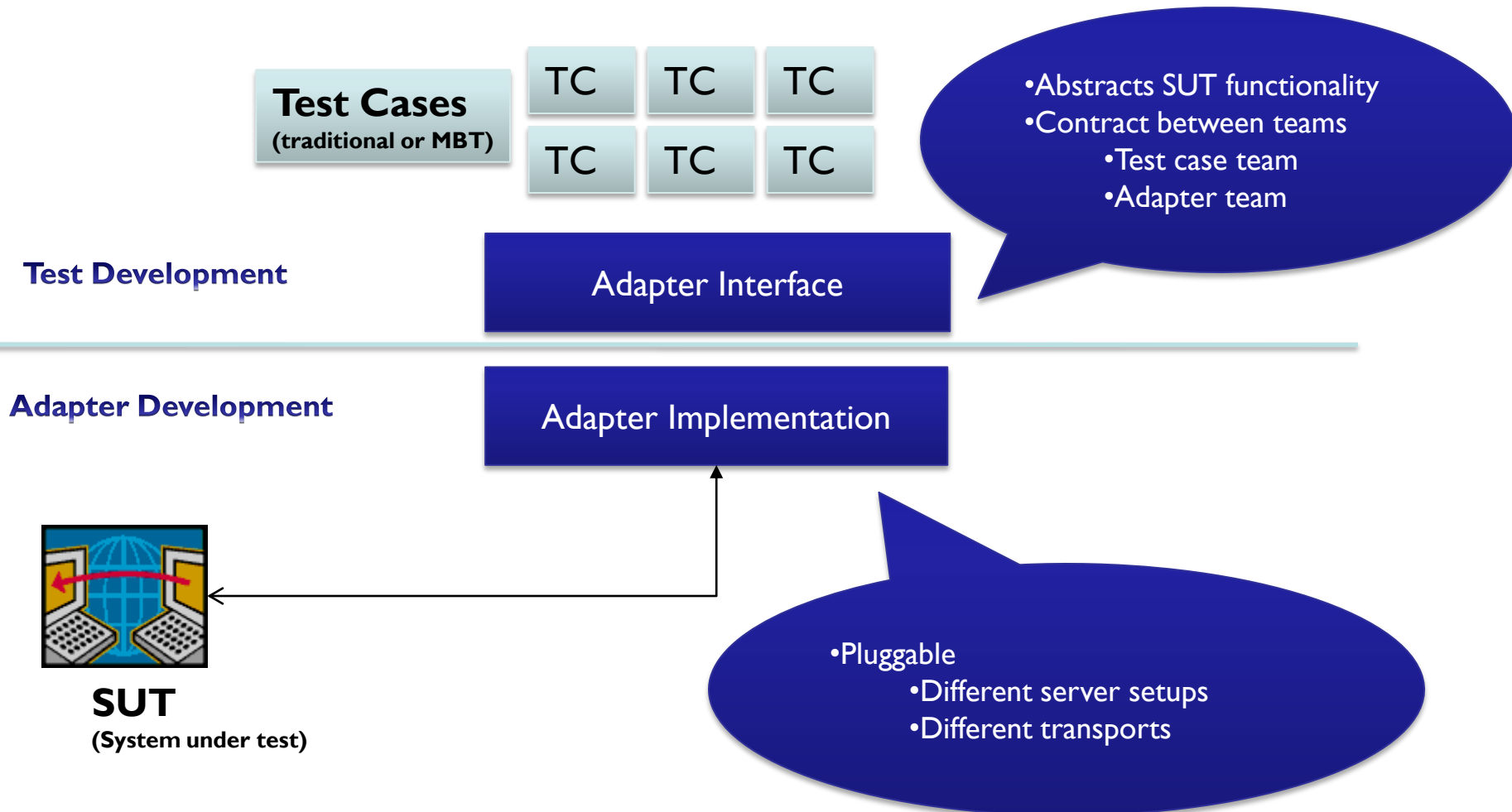
# The Value of Modeling

- ❑ Model-Based Testing vs. traditional testing comparison
  - ❑ Empirical SE Research group assessed statistical significance
  - ❑ Uniform sample from one testing site
  
- ❑ Modeling resulted in **42%** productivity gain
  - ❑ Overall, modeling saved 50 person-years (12,547 days)
  
- ❑ No formal methods background was required
  - ❑ Teams of junior engineers
  - ❑ Mostly vendors, fresh out of college

- ❑ Getting data on the wire and back
- ❑ Known problem for protocol testing (e.g. TTCN-3)
- ❑ Our Solution: Protocol Test Framework (PTF)
  - ❑ Test adapters written in a managed language (C#)
  - ❑ Custom support for dealing with protocols
  - ❑ Automatic data packet (de)serialization
    - ❑ Based on declarative data definitions
  - ❑ Protocol-specific logging capacity
    - ❑ Beacon packets



# Test Adapters



# Spec Explorer

A Model-Based Testing Tool from Microsoft

- ❑ Multiple modeling styles and languages
  - ❑ Programs, patterns, diagrams
- ❑ Asynchronous & non-deterministic systems
- ❑ State machine extraction from model program
- ❑ Test code generation from state machine
- ❑ Model composition

- ❑ Internally used to test several Microsoft products
- ❑ External Early Adopter Program
- ❑ Shipping plans
  - ❑ MSDN DevLabs
  - ❑ Visual Studio 2010 Beta 2 timeframe

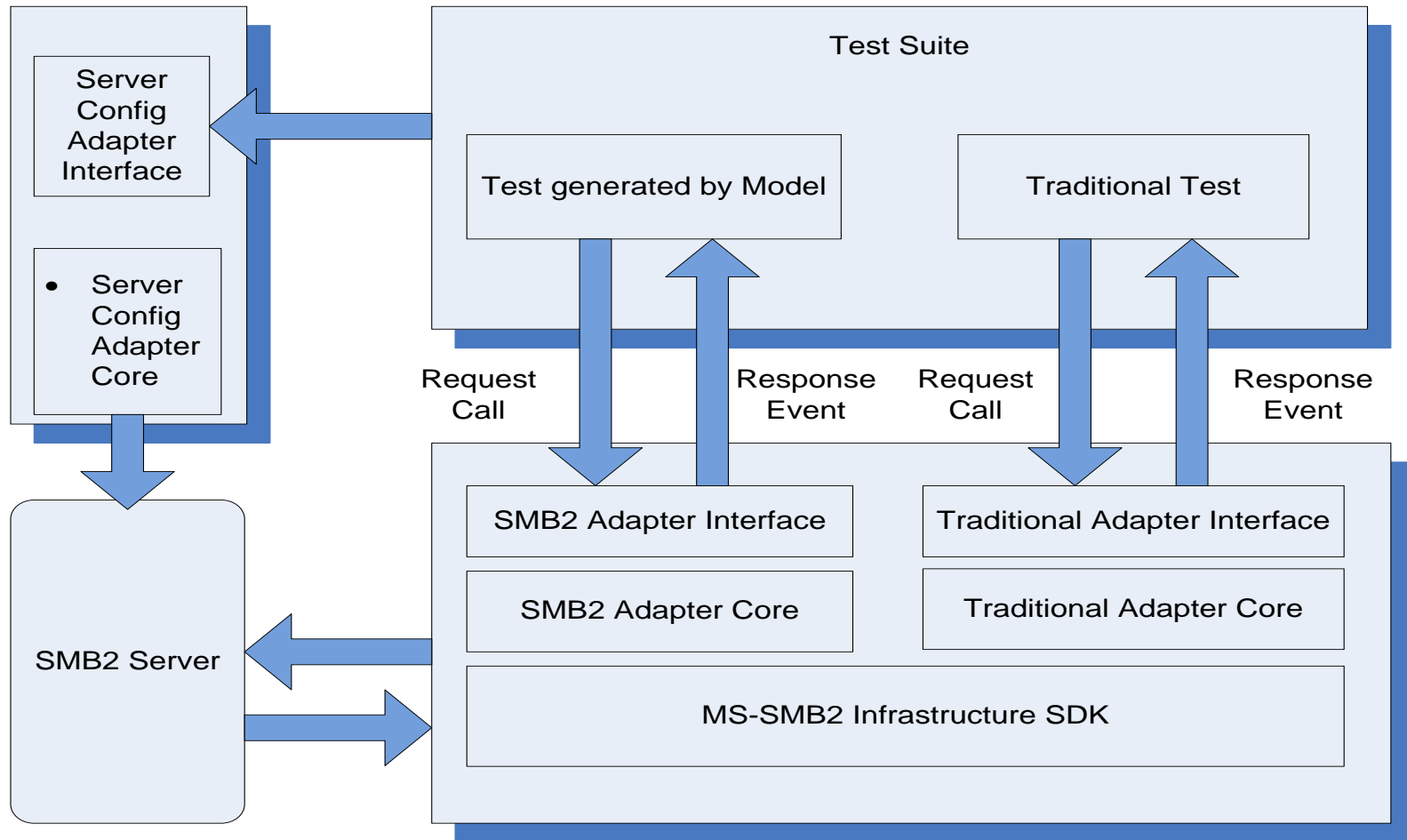
# SMB2 Interoperability Test Suite

- ❑ Validate the Technical Document against Windows for interoperability
  - ✓ Accuracy
  - ✓ Consistency
  - ✓ Usability
- ❑ Aimed at the Microsoft Communications Protocol Program
  - ❑ Only server behavior is tested

# Test Approach (First Pass)

- ❑ Assumptions
  - ❑ Single connection
  - ❑ No compounded message
  - ❑ No nested shares
- ❑ Out of model scope
  - ❑ GSS-API authentication
  - ❑ Race conditions
  - ❑ Exhaustive flag combinations
- ❑ 121 scenarios

# Test Suite Architecture





# Demo

## The SMB2 Test Suite

- ❑ Interoperability test suites developed for 200+ protocols
- ❑ Thousands of document bugs filed and fixed
- ❑ Test suite further usage
  - ❑ Regression testing
  - ❑ Third-party implementations (Plugfests)
- ❑ SMB2 test suite (first pass)
  - ❑ Document improvement
  - ❑ 80% requirement coverage

# Questions

{nicok, albertle} @ microsoft . com

<http://www.microsoft.com/protocols/>